Geol Survey

State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

GUIDE LEAFLET

GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA

MONTICELLO-MAHOMET AREA

Champaign and Piatt Counties

Monticello and Mahomet Quadrangles

Leaders
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Urbana, Illinois
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GUIDE LEAFLET 1969 E HOST: Monticello High School

TO THE PARTICIPANTS:

The Geological Science Field Trip program is designed to acquaint Illinois residents with the landscape, the rock and mineral resources, and the geological processes that have led to their origin. With this program, we hope to stimulate a general interest in the geology of Illinois and a greater appreciation of the state's vast mineral resources and their importance to the over-all economy.

We encourage you to ask the tour leaders any questions that may occur to you during the trip. Discussion often clarifies points that otherwise would remain confused to many of the participants. We also invite your written comments upon the conduct of the trips so that we might improve them as much as possible.

Additional copies of this guide leaflet, as well as itineraries for field trips that have been held in the past, may be obtained free of charge by writing to the Illinois State Geological Survey. The itinerary maps for each field trip can be purchased for 10 cents each.

Several of the stops along this itinerary are located on private property whose owners have graciously given us permission to visit their lands. Please obey the instructions of your trip leaders and conduct yourselves in a manner that will show respect for the property owners' cooperation. Please do not litter, or climb on fences, and leave all gates as found, so that we may be welcome to return on future field trips. These simple rules of courtesy also apply to public property as well. For the convenience of those persons who may use this itinerary at some future time, the names and addresses of every private property owner are listed for the respective stops on a page at the back of this guide leaflet. Whenever possible, always attempt to obtain permission when visiting private property.

We hope that you enjoy today's field trip and will attend others in the future.

THE STAFF
EDUCATIONAL EXTENSION SECTION
ILLINOIS STATE GEOLOGICAL SURVEY

MONTICELLO-MAHOMET GEOLOGICAL SCIENCE FIELD TRIP

INTRODUCTION

Glacial History of Illinois

During the Pleistocene Epoch, commonly referred to as "The Great Ice Age," an extensive continental ice cap developed in the northern hemisphere during times when the mean annual temperatures were a few degrees cooler than they are now. The portion of the ice cap that intermittently covered northern North America has been named the Laurentide Ice Sheet. Beginning about 1 million years ago and ending only 5000 years ago, southward expansions of the ice sheet caused four major glacial invasions of Illinois and the Midwest. The ice that entered Illinois came from centers in central and eastern Canada. Each of the four major glacial advances were followed by long, warm interglacial intervals during which the glaciers melted completely away (see attached Pleistocene Time Table). During these intervals, the deposits left by the glaciers eroded and weathered. Each of the glacial advances produced significant changes in the topography and drainage of the glaciated areas. In order of occurrence, the glaciations of the Midwest have been named the Nebraskan (fig. 1), the Kansan (fig. 2), the Illinoian (fig. 3), and the Wisconsinan (fig. 4). The names are derived from the states where glacial deposits of these ages are best developed or were first described. The last glacier, the Wisconsinan, melted from northeastern Illinois a mere 10,000 years ago.

The glaciers transported vast amounts of rock and soil debris that was eroded from the land areas over which they moved. As the glaciers advanced and later melted back, these materials, known as drift, were deposited. Figure 5 shows the various drift deposits and glacial landforms that are found in Illinois. Within the areas that were covered by the ice, there are extensive surficial deposits of ice-laid material called till. Areas that were covered several times by glaciers may have more than one layer of till. Till is an unsorted, unstratified mixture of all sizes of rock debris that generally has the consistency of pebbly clay. Numerous arcuate till ridges called end moraines were formed at the margin of the Wisconsinan glacier in northeastern Illinois (see Glacial Map of Northeastern Illinois). Each end moraine represents an advance of the glacier and a line along which the ice margin maintained a temporary fixed position. The moraines were built up by rock debris carried forward to the melting ice front. Thinner deposits of till that form gently undulating plains between the end moraines are known as ground moraines or till plains.

Sorted and stratified water-laid materials known as outwash, consisting of clay, silt, sand and gravel, were also deposited as a result of the glaciations. Outwash sediments were deposited by debris-laden meltwaters flowing away from the ice fronts during both the advances and retreats of the glaciers. Near the glacial margins, where meltwater was often not confined to definite channels, the outwash was laid as thin blanket-like deposits called outwash plains. In some places, elongated ridges of sand and gravel represent channel deposits of meltwater streams that flowed on or under the glaciers. Conical mounds of outwash, called kames, were formed where meltwater plunged through crevasses in the ice or into ponds along the edge of the glacier. Glacial lakes formed by the ponding of meltwater in valleys, in low areas on till plains and behind end moraines were also the sites of deposition of the finest outwash sediments. Outwash deposits were often overridden by the advancing glaciers, so that the drift deposits typically consist of interstratified layers of till and outwash. There is also interfingering of these materials laterally.

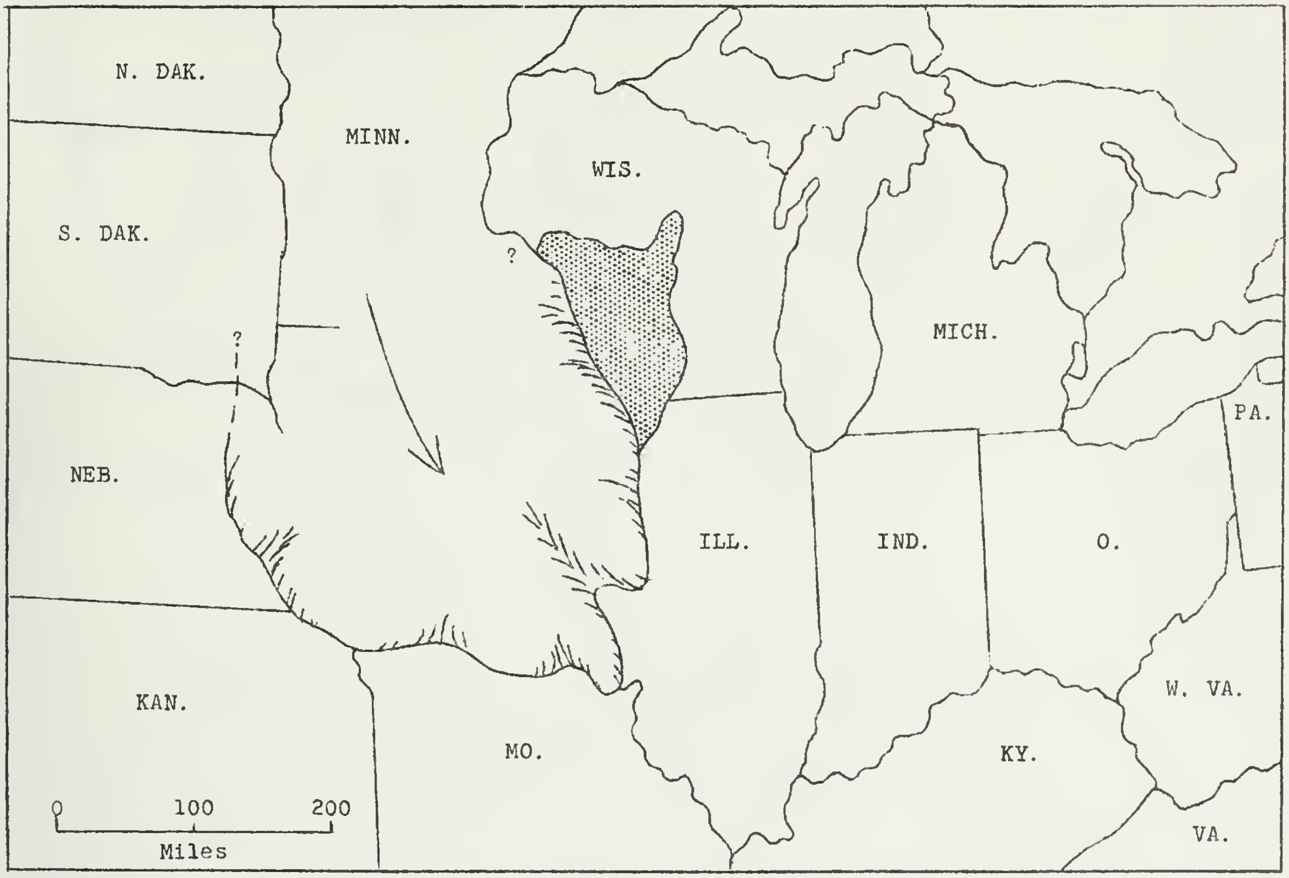


Fig. 1 - Maximum extent of Nebraskan glaciation (1,000,000 years ago). Driftless Area shown by stippled pattern. Arrow indicates direction of ice movement.

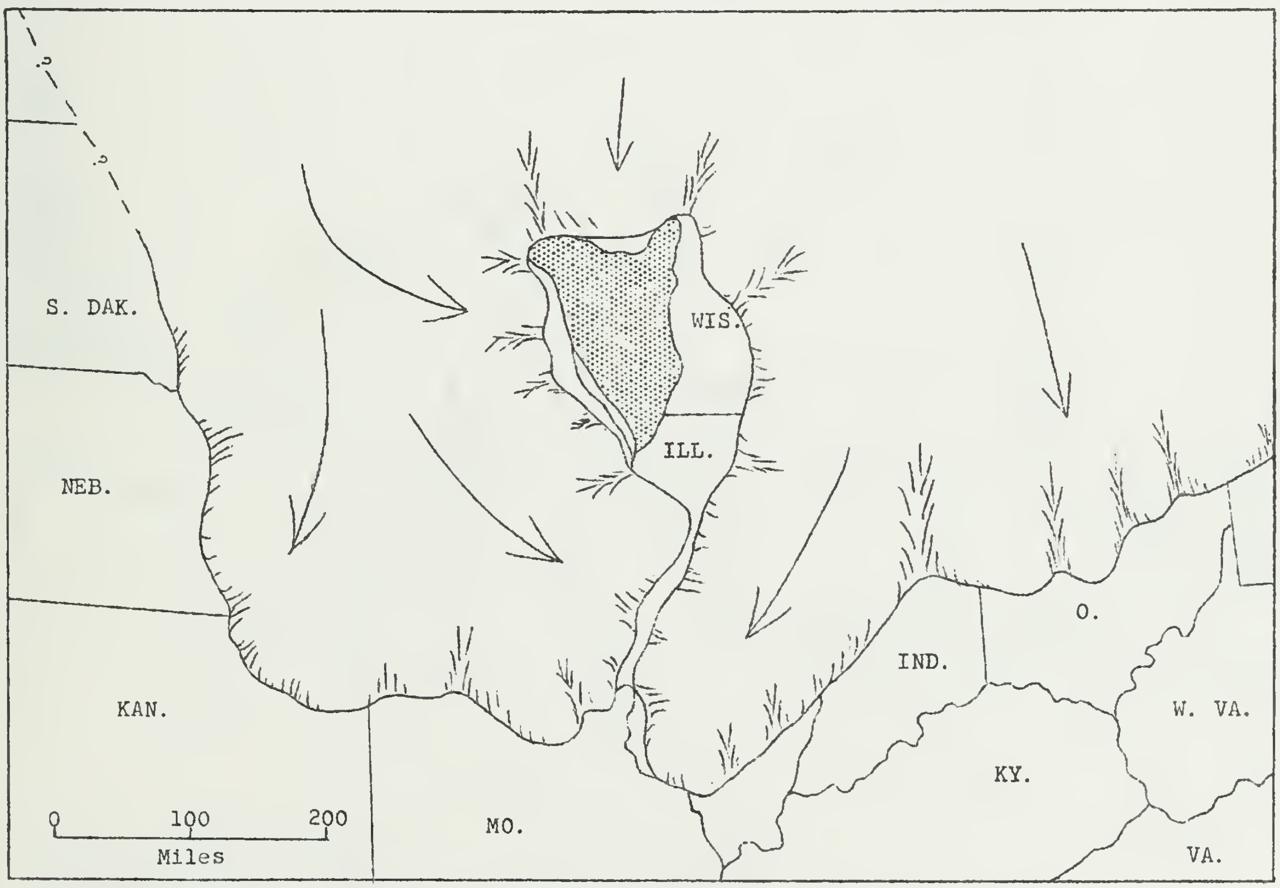


Fig. 2 - Maximum extent of Kansan glaciation (700,000 years ago).

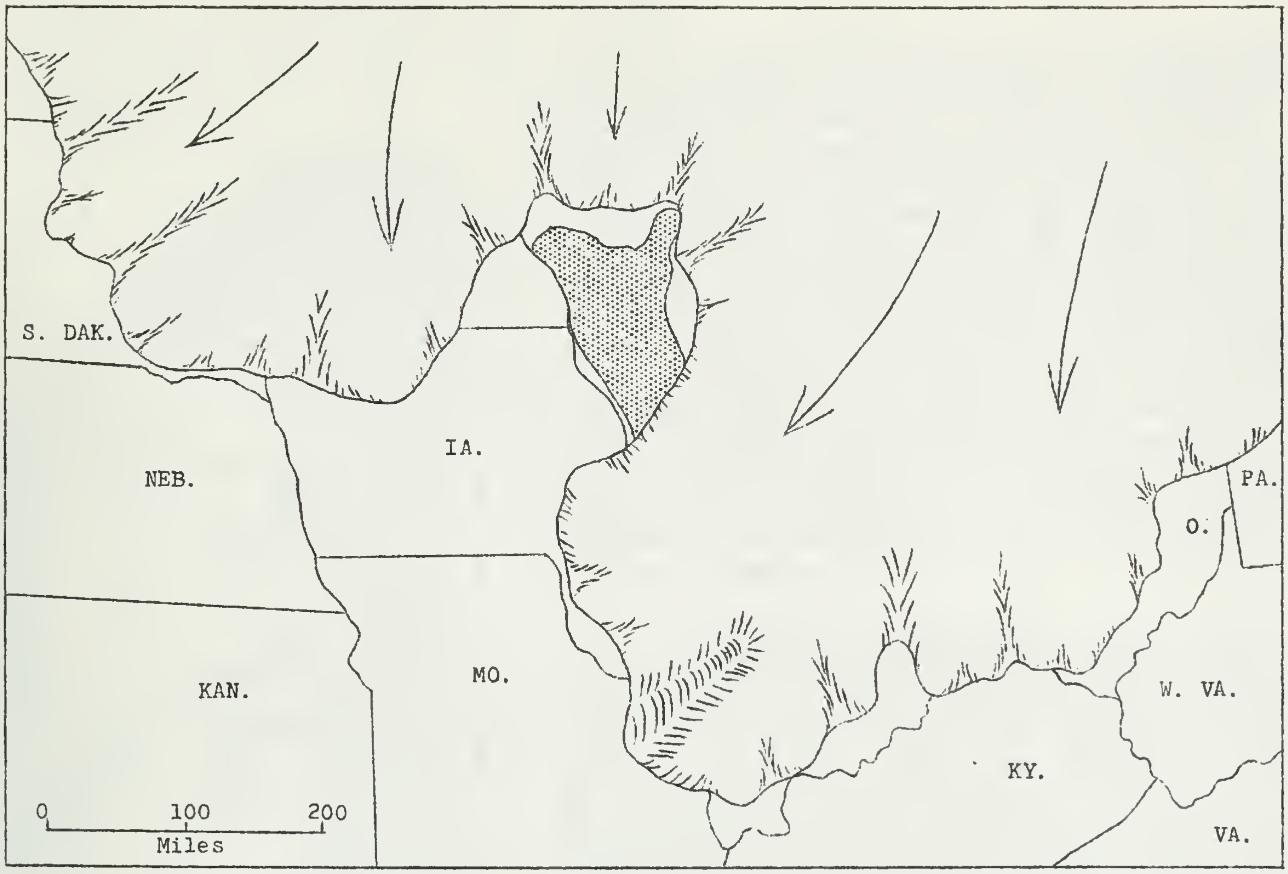


Fig. 3 - Maximum extent of Illinoian glaciation (250,000 years ago).

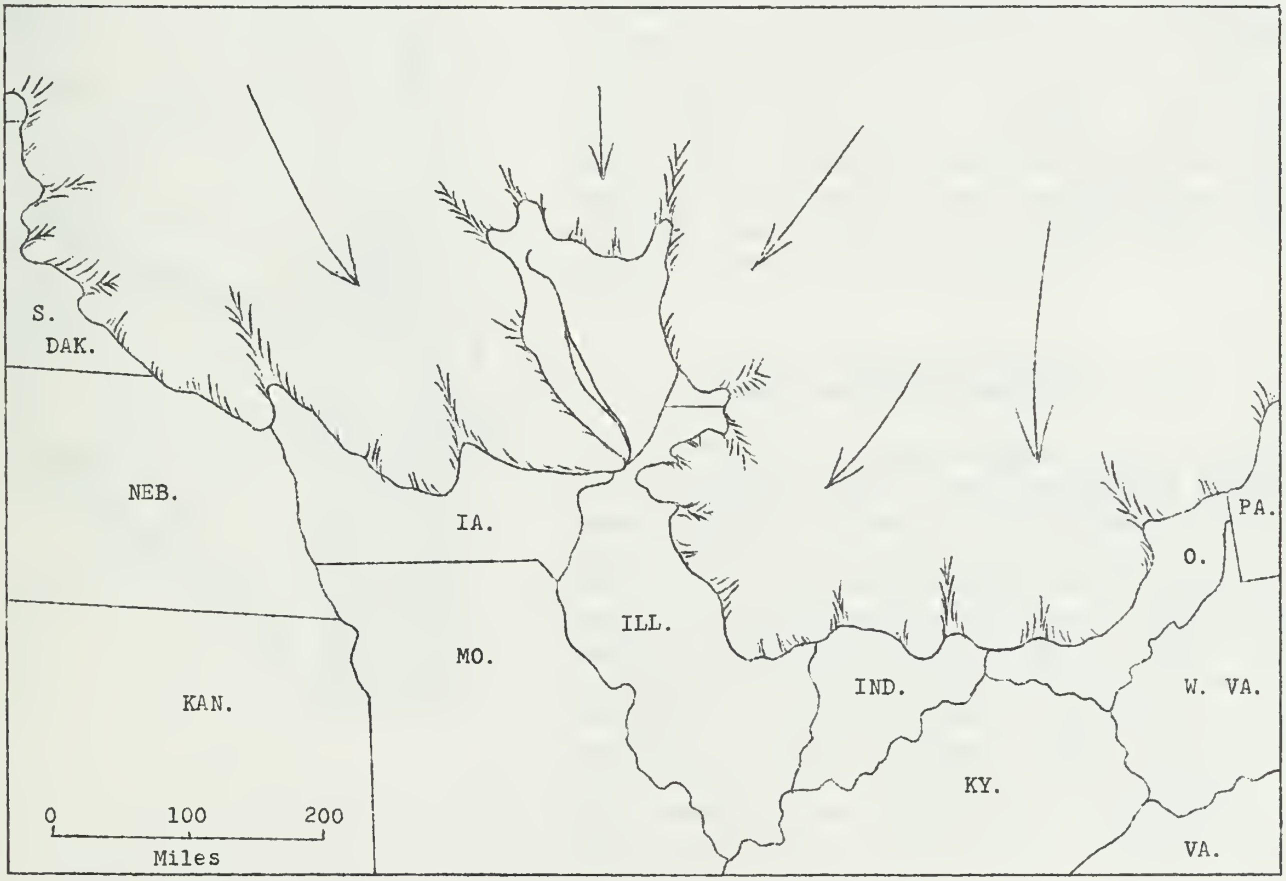


Fig. 4 - Maximum extent of late Wisconsinan glaciation (22,000 years ago).

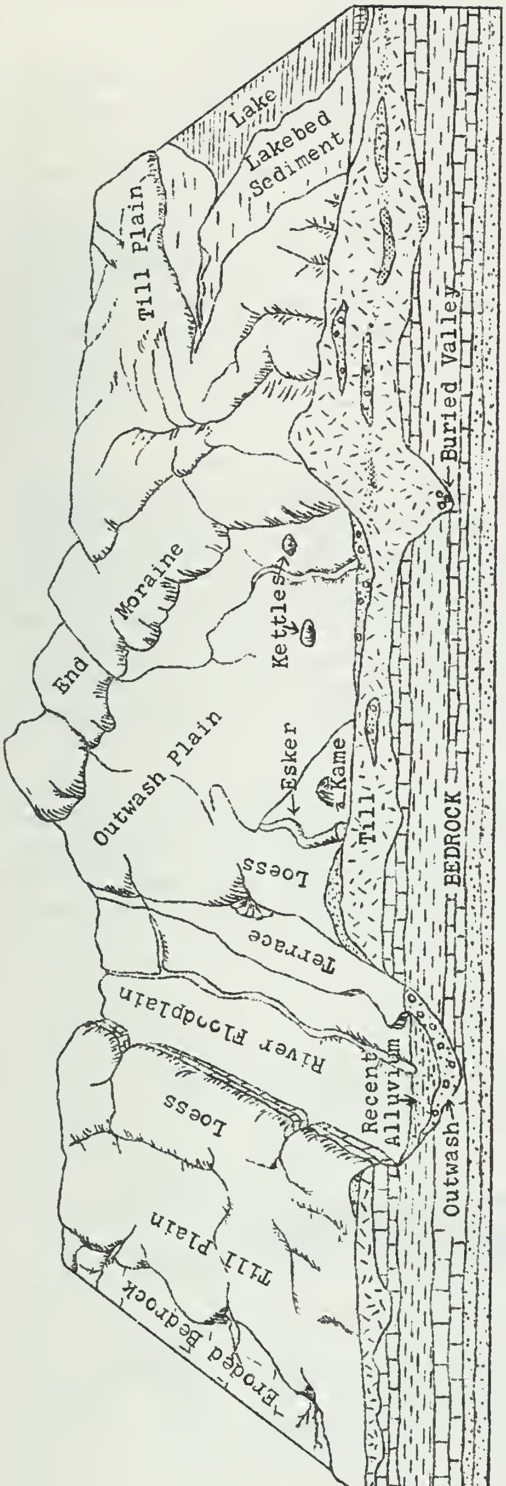


Fig. 5 - Block diagram showing relation of glacial and alluvial deposits to land forms and bedrock surface.

River valleys, such as the Mississippi, Illinois, and Ohio, provided major channelways for escaping meltwaters. These valleys were greatly widened and deepened in the bedrock during times of greatest meltwater floods. When the floodwaters were waning, the valleys were partially filled with outwash far beyond the ice margins. The outwash deposits, consisting largely of sand and gravel, are known as valley trains. For example, along much of its length, the valley train of Illinois Valley is more than 200 feet thick. Many former river valleys in areas covered by the glaciers were completely filled and buried by glacial deposits. The meltwaters also cut new valleys and caused numerous changes in the drainage system, some temporary and some permanent.

Deposits of wind-blown silt, called loess, which form the surface materials over most of Illinois, are also the result of glaciation. The silt was blown from floodplains of the valley trains. Most loess deposition occurred in the fall and winter seasons, when colder conditions caused meltwater floods to recede, exposing the surfaces of the valley trains and permitting them to dry out. During Pleistocene time, as now, the winds prevailed westerly, and as a result, the loess deposits are thickest on the east sides of the source valleys. The loess is as much as 90 feet thick on the east bluff of Illinois Valley in Cass County. The loess thins rapidly away from the valleys. The valley train of the Illinois Valley was the principal source of loess for the Monticello-Mahomet area where the loess thinly covers the upland and is generally less than 5 feet thick.

Geologic Setting of the Monticello-Mahomet Area

The Monticello-Mahomet area is situated in the southern part of the Bloomington Ridged Plain, a region of gently undulating plains in northeastern Illinois that is crossed by more than 20 of the Wisconsinan end moraines (see Physiographic Division of Illinois). This topography is chiefly the result of the deposition of drift by the mid-Wisconsinan Woodfordian glacier that intermittently covered the region near the end of the Ice Age, about 22,000 to 12,000 years ago. Because of the relatively short time that has passed since the glacier finally melted away, the glacial topography is

well-preserved and has been modified only slightly by post-glacial stream erosion. Thus, the region is an excellent place to study the effects of continental glaciation.

The Monticello-Mahomet area was covered by continental glaciers during the Kansan, Illinoian, and Wisconsinan glaciations, the last three major glacial intervals of the Ice Age (figs. 2, 3 and 4). These enormous ice sheets entered the field trip area from the northeast. The earlier Nebraskan glacier apparently did not enter eastern Illinois. The glaciations resulted in the deposition of thick deposits of ice-laid till and outwash over the bedrock surface in the field trip area. An ancient valley system, the Mahomet Valley and its tributaries, which was deeply eroded in the bedrock surface before the glaciers covered the area has been completely buried by the glacial deposits. Over most of the area, the thickness of the drift ranges from 50 to 200 feet, but over the Mahomet Valley, the drift is more than 400 feet thick. The thickest drift occurs near Mahomet where the Champaign Moraine crosses the buried valley.

The topography of the field trip area is almost entirely the result of the Woodfordian glaciation. The buried bedrock surface is completely obscured by the glacial deposits and has almost no effect on the surface topography. Little erosion has taken place since the glacier melted back and exposed the glacial deposits. The Cerro Gordo, West Ridge and Champaign Moraines cross the field trip area. These end moraines, which were formed during three stands of the Woodfordian glacier about 20,000 to 18,000 years ago, are the most prominent topographic features. The end moraines are low, narrow, hummocky ridges that stand from 40 to more than 100 feet above the gently undulating to almost flat areas of ground moraine (till plains).

The field trip area was also covered during the first advance of the Woodfordian glacier about 22,000 years ago. This advance formed the Shelbyville till plain, an almost featureless surface west of the Sangamon River. The glacier also formed the Shelbyville Moraine at Shelbyville, Mattoon and Charleston which marks the southernmost advance of the Wisconsinan glacier into Illinois (see Glacial Map of Northeastern Illinois).

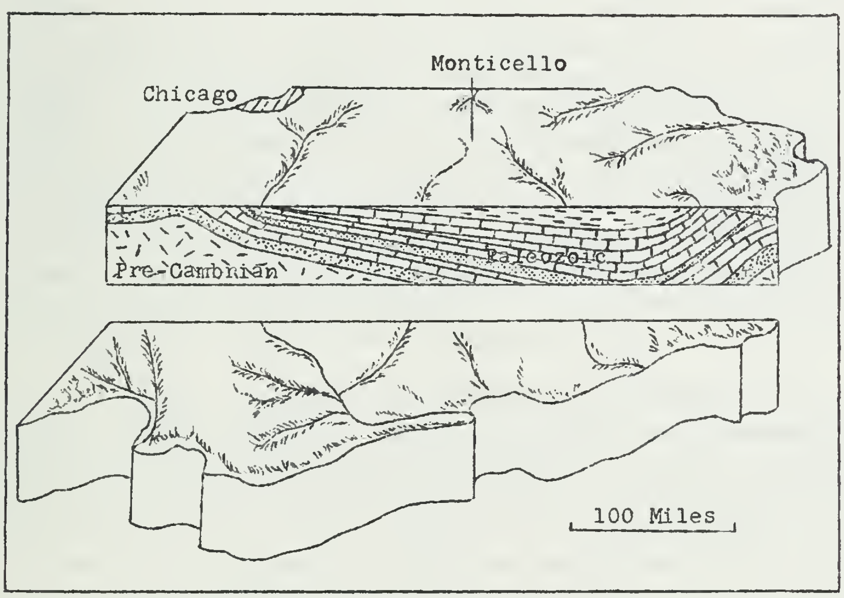


Fig. 6 - North-south cross-section through Illinois showing the Paleozoic strata in the Illinois Basin.

The field trip area has few streams and is poorly drained. These streams, which flow toward the southwest in narrow, shallow valleys, established their courses on the Wisconsinan till plain as each advance of the Woodfordian glacier melted back. Because of the relatively short time since the ice melted, the drainage system is in a very young stage of development. The Sangamon River is the only major through-flowing stream. The Sangamon River, which flows through the Champaign Moraine at Mahomet and follows the front of the Cerro Gordo Moraine past Monticello, has

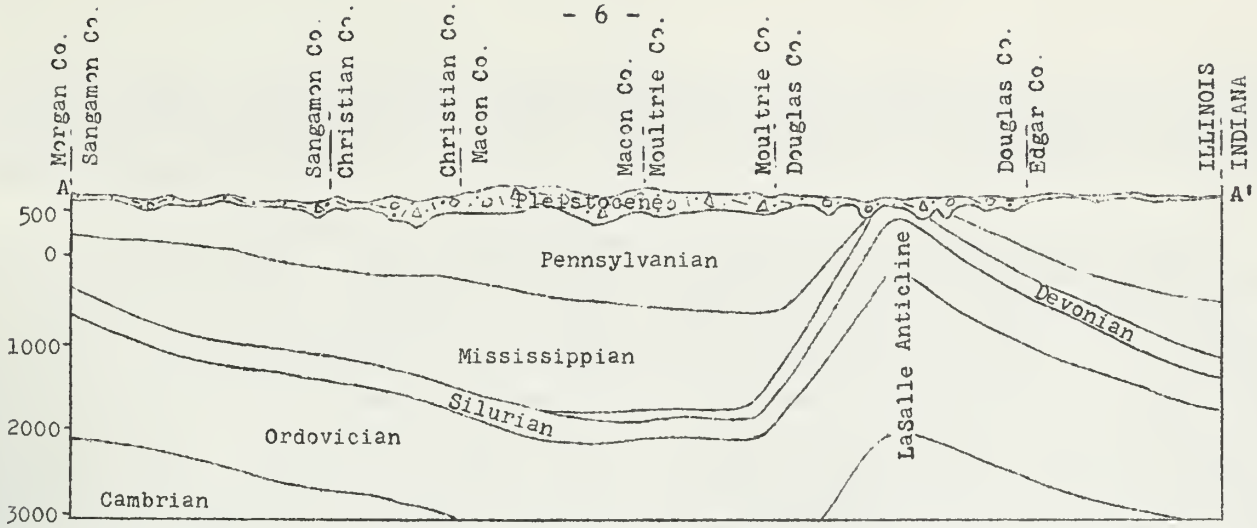


Fig. 7 - Cross section of bedrock systems from west to east in east-central Illinois (see fig. 8 for line of section). Types of strata are not illustrated.

its headwaters at the front of the Bloomington Moraine, about 15 miles to the north, near Gibson City. Much of the erosion of Sangamon Valley was probably accomplished by meltwater as the glacier melted back from the Champaign Moraine. The Kaskaskia River, another major Illinois river, has its headwaters at the front of the Champaign Moraine between Mahomet and Champaign.

The relatively young glacial drift is underlain by approximately 7000 feet of much older, consolidated sedimentary bedrock formations (fig. 5). These formations consist mainly of shale, sandstone and limestone that were deposited layer by layer in the ancient shallow seas that intermittently covered the Midwest during the Paleozoic Era, between about 550 and 270 million years ago. The bedrock is deeply buried by the glacial deposits and is nowhere exposed in the field trip area. The nearest exposure of bedrock occurs about 30 miles to the east in Vermilion County.

The bedrock strata are divided into major subdivisions known as systems, each of which was deposited during a specified period of geologic time. The bedrock surface in the field trip area is a preglacial erosion surface formed on shales of the Pennsylvanian System, the youngest Paleozoic rocks in Illinois (fig. 6 and Geologic Map of Illinois). The Pennsylvanian rocks are about 1000 feet thick and contain the valuable coal beds that are mined in other parts of Illinois. They overlie approximately 6000 feet of older Mississippian, Devonian, Silurian, Ordovician and Cambrian sedimentary rocks. All of these strata are known from deep wells and from exposures in areas where they form the bedrock surface. The base of the Cambrian strata rests on an ancient erosion surface developed on Precambrian igneous and metamorphic rocks that are more than 1 billion years old. These very old crystalline rocks are not exposed anywhere in Illinois, but they are exposed in northern Wisconsin and farther to the north in Canada.

Geologically, the Monticello-Mahomet area is situated near the eastern margin of the Illinois Basin, a large, spoon-shaped bedrock structure that underlies most of Illinois and adjacent parts of Indiana and Kentucky (fig. 6). As the basin was forming during the Paleozoic Era, it was gradually filled with the Paleozoic sedimentary strata. In the deepest part of the basin in White County in southeastern Illinois, the Paleozoic rocks are more than 13,000 feet thick. Regionally, the bedrock strata in the field trip area are tilted gently southward toward the deepest part of the Illinois Basin. At the eastern edge of the field trip area, the strata have been warped into a broad arch called the LaSalle Anticline (fig. 7). The LaSalle Anticline

can be traced as a belt of folded strata along the eastern part of the Illinois Basin from Ogle County southeastward to Wabash County (see attached Geologic Map of Illinois). The anticline brings strata as old as the Silurian to the bedrock surface in western Champaign County.

Mineral resources being exploited in the field trip area include only common sand and gravel. These commodities are produced from Wisconsinan outwash in the Sangamon Valley near Mahomet. In 1967, Illinois produced 33.5 million tons of sand and gravel, mainly from glacial outwash, valued at $30.4 million. These materials are used for various purposes in the building and construction industries. Oil has not been discovered in commercial quantities in the bedrock strata of the field trip area. Coal beds in the Pennsylvanian strata are too deep to be mined profitably at the present time. Large quantities of cool, extremely pure groundwater for domestic and industrial needs are available from the buried Mahomet Valley. Largely untapped, this groundwater source promises to be an increasingly valuable asset to east-central Illinois.

ITINERARY

0.0 0.0 Assemble at northeast corner of Monticello High School. Proceed north on Hamilton Street. STOP. East Marion Street. Continue ahead north.

0.4 0.4 STOP. Turn right (east) on East Washington Street.

0.4 0.8 Leave Monticello. Directly ahead the low, irregular ridge on the horizon is the Cerro Gordo end moraine.

0.5 1.3 Ascend the moraine.

1.0 2.3 T-road from left. Continue ahead east.

0.2 2.5 Stop 1. Till exposure at top of Cerro Gordo Moraine (NE corner NW 1/4, Sec. 16, T. 18 N., R. 6 E.).

This stop is on the highest part of the Cerro Gordo Moraine, an elevation of more than 760 feet. The moraine stands about 70 feet above the Cerro Gordo till plain that stretches as an almost flat, featureless surface toward the east. The moraine is named after the town of Cerro Gordo which is situated on the moraine, about 13 miles southwest of Monticello.

In the field trip area, the Cerro Gordo Moraine forms a slightly elevated belt of hummocky topography 1 to 4 miles wide from Mahomet past Monticello (see itinerary map). The Sangamon River follows the front edge of the moraine, which had an important influence on the position of the valley in this area. The moraine is the most sharply arcuate of the Wisconsinan end moraines and it can be traced for about 120 miles, almost to the Indiana line (see Glacial Map of Northeastern Illinois). The Cerro Gordo Moraine probably represents a relatively minor readvance of the Woodfordian glacier after it had melted back an indeterminate distance from the Shelbyville Moraine.

There are more than 30 named Woodfordian end moraines and several unnamed ones in northeastern Illinois. Each of these end moraines represents a separate advance or pulsation of the glacier that resulted from slight cooling in climatic

conditions after a slight warming had caused the glacier to melt back. The Woodfordian glacier melted back and readvanced many times. How far the ice melted back during each recession is not known. The discordant and overlapping relationships of several of the moraines suggests that at times, the ice front had melted back a considerable distance before readvancing to the position of the next moraine. The different alignments and configurations of the moraines indicate that the ice also followed somewhat different lines of movement during each of the advances. The pronounced arcuate or lobate regional form of the Wisconsinan moraines reflects the strong influence of the basins of Lakes Michigan, Huron and Erie on the flow of the glacier. Great tongue-shaped masses of ice were channeled southwestward from these deep, round-bottomed basins.

The end moraines were built during times when the ice front remained essentially stationary. This occurred when the forward movement of the glacier was balanced by the rate of melting at the ice margin. Rock debris released from the melting ice front was gradually piled up to form the moraine. The forward moving glacier acted like a sort of conveyer belt that continually transported new rock material to the edge of the ice. End moraines are formed mainly of till, but because much meltwater was produced at the edge of the glacier, most end moraines consist of complex mixtures of till and outwash. Outwash often occurs in meltwater channels cut through the moraines and usually forms narrow aprons or outwash plains along the fronts of the moraines. The hummocky topography on moraines is mainly the result of variable rates of deposition along the ice front during their formation. Somc of the end moraines are very broad and most have widths of at least a few miles. This indicates that the ice margin fluctuated back and forth within a narrow zone during the building of each moraine. The lower, flatter ground moraines are thinner accumulations of till that were deposited beneath the glacier.

The roadcut at this locality affords an opportunity to examine the till that forms the Cerro Gordo Moraine. About 5 feet of tan-brown, slightly gray-mottled, pebbly till is exposed on both sides of the road. The till is overlain by 3 to 4 feet of orange-brown, finely gray-mottled, granular loess. The loess is light brownish gray on the outcrop surface.

Note the massive structure of the till and the wide range of sizes of the rock fragments that it contains. The matrix of the till consists of sandy, silty clay and the till is fairly plastic when wet. The till contains a great variety of rock types, including sedimentary, igneous, and metamorphic rocks. These were eroded from the bedrock areas over which the glacier moved. Sandstone and limestone fragments eroded from the Pennsylvanian strata of east-central Illinois are quite abundant. There are also abundant chert and dolomite fragments from the Silurian strata of northeastern Illinois. The igneous and metamorphic rocks are not indigenous to Illinois but were transported from eastern Canada where they are extensively exposed at the bedrock surface. An excellent rock collection can be made in a short time. Of special interest are the numerous rock fragments that are faceted (flattened on one or more sides) and striated (scratched) as a result of grinding and abrasion during transport by the glacier. These rocks were held fast in the ice and were ground against other rocks and perhaps even against the frozen ground over which the glacier slowly moved.

The loess above the till is a very fine powdery material that consists predominantly of silt. The modern surface soil is developed in the loess. The loess is the Peoria Loess that was deposited during the numerous advances and retreats of the Woodfordian glacier that followed the formation of the Cerro Gordo Moraine. This occurred between 18,000 and 10,000 years ago. The loess is an eolian silt that was

eroded from the valley trains of the Mississippi and Illinois valleys and carried eastward by the wind across Illinois. Because of its fine-grained homogeneous texture, loess is typically massive and unstratified. The Peoria Loess is usually tan in color.

The loess and the upper 2.5 feet of the till have been deeply weathered during post-glacial time. The carbonate minerals that usually occur in unleached glacial materials have been leached out. Most glacial drift contains a considerable amount of finely ground limestone and dolomite because the glaciers moved over extensive areas of limestone and dolomite formations as they advanced across the Midwest. The depth of leaching, caused by downward percolating rainwater carrying organic acids generated in the modern soil, can be determined by applying a dilute solution of acid such as HCl. The acid causes the unleached till to bubble because of the reaction with the finely ground limestone and dolomite. Carbon dioxide gas is given off. The acid test is useful when studying glacial deposits to determine the presence of buried soils and weathered zones in the drift. The depth of leaching is sometimes useful in determining the relative ages of glacial deposits.

Leave Stop 1. Continue ahead (east).

0.1 2.6 Descend back slope of Cerro Gordo Moraine.

0.5 3.1 We are now on the till plain. Notice how relatively flat to very gently undulating the surface is throughout this area.

The glaciers were great leveling agents as a result of both planation by glacial erosion and deposition of drift. Illinois is located at the periphery of the glaciated region where glacial melting and drift deposition were predominant. The effect of glacial deposition was to fill in the irregularities of the bedrock surface and produce a smoother topography. This locality is over the deepest part of the Mahomet Valley. The thickness of the drift in this vicinity is more than 300 feet.

1.0 4.1 Crossroads. Continue ahead east.

1.0 5.1 Crossroads. Turn left (north).

0.3 5.4 Stop 2. Blue Mound (SW 1/4 NW 1/4 SW 1/4, Sec. 12, T. 18 N., R. 6 E.).

One mile to the east is a low, subcircular mound called Blue Mound (see itinerary map). This mound, which is about 1/4 mile in diameter and 35 feet high, is a kame. Although the kame has little relief and very gentle slopes, it is an impressive feature on the otherwise flat Cerro Gordo till plain.

Kames are mounds of outwash that formed where meltwater plunged into subglacial pools through crevasses or holes in a glacier. Some kames were deposited where meltwater poured off the front of a glacier. The abrupt change in the gradient of the meltwater currents caused the deposition of the outwash. Most kames are steep-sided conical mounds of coarse sand and gravel because the meltwater that deposited them was swift-flowing. The relatively low profile of Blue Mound suggests that it consists mostly of sand which has a lower angle of repose than gravel.

Kames are ice-contact features that were formed when the glaciers had stagnated (stopped moving). Moving ice would have destroyed them. The preservation of Blue Mound on the Cerro Gordo till plain is evidence that stagnant ice existed

during the final melting of the glacier in this immediate locality. However, kames are rare on the till plain, suggesting that the entire glacier did not stagnate. As the ice front was melting back, the glacier probably became very thin near its margin. From time to time small masses of ice were detached from the receding glacier and left behind on the till plain. As these standing blocks of ice melted, small kames like Blue Mound were deposited. Such a limited source of outwash would also explain the small size of the kame.

Several smaller kames are located on the till plain about 7 miles to the east. Another is located 2 miles to the northwest. Several small kames also occur on the Shelbyville till plain at the front of the Cerro Gordo Moraine at Centerville, 3 miles north of White Heath.

Leave Stop 2.

0.2	5.6	Note the back slope of the Cerro Gordo Moraine to the left.
0.5	6.1	Crossroads. Continue ahead straight.
0.8	6.9	Note erratics on the right side of road.
0.2	7.1	Crossroads. Turn left (west).
0.3	7.4	Note the large number of erratics along the right side of the road that are being used as a low wall. The boulders are known as "erratics." Erratics are glacially transported rocks, most of which are not indigenous to the areas in which they are found. The majority of the larger erratics in Illinois are igneous and metamorphic rock fragments which are hard and very resistant to glacial abrasion.
0.3	7.7	Note the small kame on the left.
0.4	8.1	STOP. Crossroads. Turn right (north).
0.7	8.8	Cross Camp Creek.
0.2	9.0	Till exposed in the ditch on the right. Notice the large erratic on the left.
		T-road from right. Continue ahead (north).
0.1	9.1	T-road from left. Continue ahead (north).
1.0	10.1	Crossroads. Turn left (west).
0.3	10.4	Sharp right at ballpark. Enter village of White Heath.
0.1	10.5	T-road from left. Turn left (west). Junkyard on right.
0.3	10.8	Unguarded railroad crossing.
0.2	11.0	T-road intersection. Turn right (north).
0.1	11.1	STOP. Old Route 47. Continue straight ahead on dead-end road.

0.1 11.1 Stop. Walk across field to abandoned borrow pit about 600 feet to the west.

Stop 3. Exposure of Cerro Gordo till (SW 1/4 NW 1/4 SW 1/4, Sec. 22, T. 19 N., R. 6 E.).

This abandoned borrow pit is situated on the Cerro Gordo Moraine and affords an excellent opportunity to examine the till that was deposited by the Cerro Gordo glacier. The exposure exhibits the typical, tough, compact, homogeneous properties of till better than the exposure at Stop 1. The deposits in the exposure are described below:

	Thickness (feet)
PEORIA LOESS	
Silt, orange-tan, gray-mottled, massive, sandy with scattered pebbles at base; leached with surface soil	4.0
CERRO GORDO TILL	
Till, reddish brown, massive, sandy, stony, leached	0.8
Till, grayish brown, massive, silty, stony as above, slightly calcareous, oxidized . . .	2.0
Till, as above, very calcareous	1.5
Till, as above, finely jointed (fractured), rusty along joint surfaces, grades abruptly into gray till below	6.0
Till, as above but gray, unoxidized	2.0+

As noted earlier at Stop 1, the Cerro Gordo till is very stony and contains numerous pebbles and cobbles of a great variety of rock types. Faceted and striated rock fragments are extremely abundant. The effects of weathering of the till sheet are especially evident in this exposure. The till grades downward from leached, oxidized till at the top, through oxidized till, to unaltered till at the bottom of the exposure. The modern soil extends completely through the loess into the upper part of the till, and total depth of weathering extends through the upper 10 feet of the till. Below the leached zone, the oxidation of iron-bearing minerals in the till is evident by the color change from the gray of the unaltered till to brown.

The contact or boundary between the loess and the top of the till is not sharp. The lower foot of the loess is mixed with sand and gravel that may represent a lag deposit formed as a result of washing of the till surface by meltwater. Deposition of outwash and loess took place simultaneously for a short time as the ice front melted back, producing the transition zone of mixed deposits that grade upward into normal loess. The deposit may also represent a mixture of loess and colluvium (rock debris) that was eroded by slopewash from adjacent higher parts of the moraine after the glacier had melted away. In this case, erosion would have been accomplished by rainwater.

Leave Stop 3. Return to old Route 47.

0.1 11.2 STOP. Turn right (southwest) on Route 47.

0.2	11.4	Guarded railroad crossing.
0.3	11.7	Entrance to freeway north on left. Turn left and enter freeway.
0.6	12.3	Note view of borrow pit at Stop 3 on right. Stay in right lane.
1.5	13.8	SLOW. End of freeway, Enter 2-lane highway, Route 47.
0.9	14.7	Junction with Route 10. Continue ahead (east).
3.2	17.9	Crossroads. Seymour Road to the right. Continue ahead on Route 47.
1.0	18.9	Junction with Route 10. Continue straight ahead.
1.7	20.6	Enter Bondville. SLOW. Prepare to turn left beyond school.
0.3	20.9	Turn left onto Market Street. Continue ahead (north).
0.5	21.4	Overpass over Interstate 74.

Stop 4. View of West Ridge and Champaign Moraines (NW 1/4 NW 1/4 SW 1/4, Sec. 12, T. 19 N., R. 7 E.).

This vantage point affords an excellent view of the surrounding Cerro Gordo till plain and the adjacent West Ridge and Champaign Moraines. The West Ridge Moraine forms the horizon about 3 miles to the east. The Champaign Moraine can be traced westward along the northern horizon from its junction with the West Ridge Moraine to the northwest of Champaign. The low Cerro Gordo Moraine can be barely distinguished along the horizon to the west. All three of these moraines were deposited during stands of the Woodfordian glacier.

The West Ridge Moraine was formed after the Cerro Gordo Moraine and before the Champaign Moraine. This end moraine probably represents a minor readvance of the Woodfordian glacier after it had melted back from the Cerro Gordo front. However, the similar alignments of the two end moraines suggest that the West Ridge Moraine may have been deposited during a temporary halt in the melting back of the glacier, rather than during the stand of a readvance. This fact is suggested by the presence of several minor till ridges that essentially parallel the trends of the Cerro Gordo and West Ridge Moraines in this vicinity (see itinerary map). There is a good possibility that these low ridges are poorly developed end moraines that were formed during short pauses in the retreat of the Cerro Gordo ice front.

After deposition of the West Ridge Moraine, the Woodfordian glacier melted back an unknown distance to the northeast. The glacier then readvanced along a slightly different line of movement to the position of the Champaign Moraine. The shape of the ice front was significantly different from the earlier fronts and the Champaign ice overrode the edges of the Cerro Gordo and West Ridge Moraines at nearly right angles. A low ridge extending northward from the Champaign Moraine as far as Rantoul may represent either or both of the Cerro Gordo and West Ridge Moraines that are buried by Champaign ground moraine (see itinerary map). The Champaign Moraine is the largest of the three end moraines and it is the most prominent topographic feature in the field trip area. Northeast of Rising, about half way between Mahomet and Champaign, the highest parts of the moraine rise to elevations of more than 850 feet. In this locality, the moraine stands 150 feet above the Cerro Gordo till plain to the south and 100 feet or more above the Champaign till plain to the northeast.

Leave Stop 4. Continue ahead (north).

0.5	21.9	Crossroads. Continue ahead north.
0.6	22.5	Notice how even the till plain is in this locality. The land surface slopes gently upward to the northeast toward the front of the Champaign Moraine.
0.4	22.9	Crossroads. Continue ahead north. At this point you are crossing one of the low ridges that were discussed at Stop 4. Another can be seen to the northwest. These ridges may be recessional moraines that formed during brief pauses in the retreat of the Cerro Gordo glacier.
1.0	23.9	T-road intersection. Turn right (east) on blacktop.
0.2	24.1	T-road from left. Turn left (north).
1.0	25.1	Unguarded railroad crossing.
0.2	25.3	Ascending front of Champaign Moraine.
0.7	26.0	STOP. Intersection with Route 150. Continue straight ahead. CAUTION.
0.1	26.1	Entrance to Interstate 74. Continue straight ahead.
0.1	26.2	Cross Interstate 74. Note the view to the north-northeast toward the highest part of the Champaign Moraine.
0.6	26.8	Four-way stop. Turn left (west) toward Lake of the Woods.
0.7	27.5	STOP. Bear left and continue ahead past main park entrance.
0.2	27.7	Entrance to Lake of the Woods picnic area. Turn right and enter park.
		Stop 5. Lunch. The park is located on the top of the Champaign Moraine.
		Leave Lunch Stop. Return to park entrance. Turn left (east) on blacktop.
0.2	27.9	Turn right at intersection at main entrance to park.
0.7	28.6	Four-way stop. Turn right (south).
0.4	29.0	Approaching entrance to Interstate 74. Continue straight ahead.
0.3	29.3	Cross Interstate 74.
0.2	29.5	STOP. Junction with Route 150. Continue straight ahead. CAUTION.
0.2	29.7	Notice the view ahead down the front of the Champaign Moraine. To the right is the Cerro Gordo Moraine.
0.7	30.4	Unguarded railroad crossing.
1.0	31.4	T-road intersection. Turn right (west).

0.2 31.6 STOP. T-road from left. Continue straight ahead.

0.7 32.3 Stop 6. View of Champaign and Cerro Gordo Moraines (SW 1/4 SE 1/4 SW 1/4, Sec. 26, T. 20 N., R. 7 E.). Stop just west of house on south side of road.

This stop affords a view of the Cerro Gordo Moraine near its junction with the Champaign Moraine (see itinerary map). The Cerro Gordo Moraine can be seen to the west as a low line of hills trending to the southwest. The Champaign Moraine is to the north and northeast. Both of these features were discussed earlier at Stop 4. To the southeast, the slight rise on the till plain is the recessional morainal ridge which was also discussed earlier. This low ridge can be traced southwestward for about 8 miles (see itinerary map).

Leave Stop 6. Continue ahead (west).

0.1 32.4 T-road from right. Continue ahead (west).

0.2 32.6 T-road from left. Continue ahead.

1.0 33.6 T-road from right. Continue ahead.

0.2 33.8 STOP. Intersection with Route 47. Turn right (north).

1.6 35.4 Cross Sangamon River bridge.

The Sangamon River is one of the major streams draining east-central Illinois. It follows a course in a great arc from near Gibson City, southwestward to Decatur and then northwestward to its junction with the Illinois River in Cass County. In the field trip area from west of Rantoul, past Mahomet to Monticello, the Sangamon Valley is over the Mahomet Bedrock Valley.

On the Illinoian till plain west of Decatur, the Sangamon Valley is older and larger than it is on the Wisconsinan drift behind the Shelbyville Moraine. The river established its course on the Illinoian till plain as a meltwater stream near the end of the Illinoian glaciation, about 200,000 years ago. The valley was deepened by erosion during the long, warm Sangamonian interglacial interval that followed between 200,000 and 70,000 years ago and during the advance of the early Wisconsinan Altonian glacier into northeastern Illinois between 70,000 and 22,000 years ago. The upper part of the valley was then overridden and buried by drift during the Shelbyville advance of the Wisconsinan (Woodfordian) glacier as far as Decatur. Meltwater cut a new valley in the till plain behind the Shelbyville Moraine as the ice front retreated. This extension of the valley behind the moraine probably took place little more than 20,000 years ago. It is not known if this new valley extended as far north as the field trip area at that time. If it did, it was buried by outwash and till during the advance of the Cerro Gordo glacier. Meltwater from the Cerro Gordo ice built a narrow outwash plain in front of the Cerro Gordo Moraine in the field trip area.

The present valley through the field trip area was established by meltwater during the advance of the Woodfordian glacier to the position of the Champaign Moraine. The valley is cut in the Cerro Gordo outwash plain. Meltwater poured through the Champaign Moraine at Mahomet and cut the valley to its present size in the Cerro Gordo outwash. As the glacier melted back from the moraine, the valley was extended northward across the Champaign till plain toward its present headwaters.

The front edge of the Cerro Gordo Moraine was cut back slightly during erosion of the valley. The meltwater was channeled southwestward along the front of the moraine which is a topographic barrier that contained the meltwater to the west and thus is partially responsible for the position of the valley in this area. Only minor amounts of outwash were deposited in the deeper, inner part of the valley by meltwater from the Champaign glacier near the end of its stand. Several feet of black alluvial silts have been deposited by floodwaters during post-glacial time.

0.5 35.9 Enter city of Mahomet. SLOW.

0.1 36.0 Railroad crossing. CAUTION.

0.2 36.2 STOP. Junction with Route 150. Continue straight ahead on Division Street.

0.1 36.3 Turn right on Dunbar Street.

STOP. Walnut Street. Continue ahead (east).

Cross Center and Lincoln Streets.

0.2 36.5 Cross Line Street and stop near city water tower.

Stop 7. Discussion of Mahomet Valley and Mahomet city well (SE 1/4 SW 1/4 NW 1/4, Sec. 15, T. 20 N., R. 7 E.).

Named after the city of Mahomet, the Mahomet Valley and its tributaries are a large bedrock valley system which formerly drained this region (fig. 8). These valleys were completely filled and buried by glacial deposits during the Ice Age. Kansan, Illinoian, and Wisconsinan drift deposits have been identified in the valley fill (fig. 9).

Mahomet, like many communities in east-central Illinois, obtains its municipal water supply from a well drilled into the Mahomet Sand, a sand and gravel aquifer in the buried Mahomet Valley. The Mahomet Sand is Kansan valley train, commonly more than 100 feet thick, that occupies the deepest part of the valley. An aquifer is a geologic formation in which porosity and permeability are high enough so that it can store and transmit groundwater. Unconsolidated sand and gravel deposits, which are abundant in the glacial drift of Illinois, are excellent aquifers because the openings between sand grains and rock fragments are large and highly interconnected. Thus, they have the capacity to store and transmit large amounts of water.

The Mahomet Sand is the most prolific aquifer in the Mahomet Valley, although large amounts of groundwater are also produced from an upper aquifer of Illinoian outwash. Sand and gravel beds in the Wisconsinan drift are thin and discontinuous and are comparatively unimportant as aquifers.

The producing well here (Mahomet Well #3) is the one farthest to the east of the treatment shed. The other two wells are presently not being used. This well was drilled in 1963 to a total depth of 252 feet, 40 feet below the top of the Mahomet Sand. All of the glacial formations penetrated during drilling are illustrated in figure 10.

According to the Illinois State Water Survey, the Mahomet Well #3 was test pumped at 300 to 650 gallons per minute at the time of its completion. The

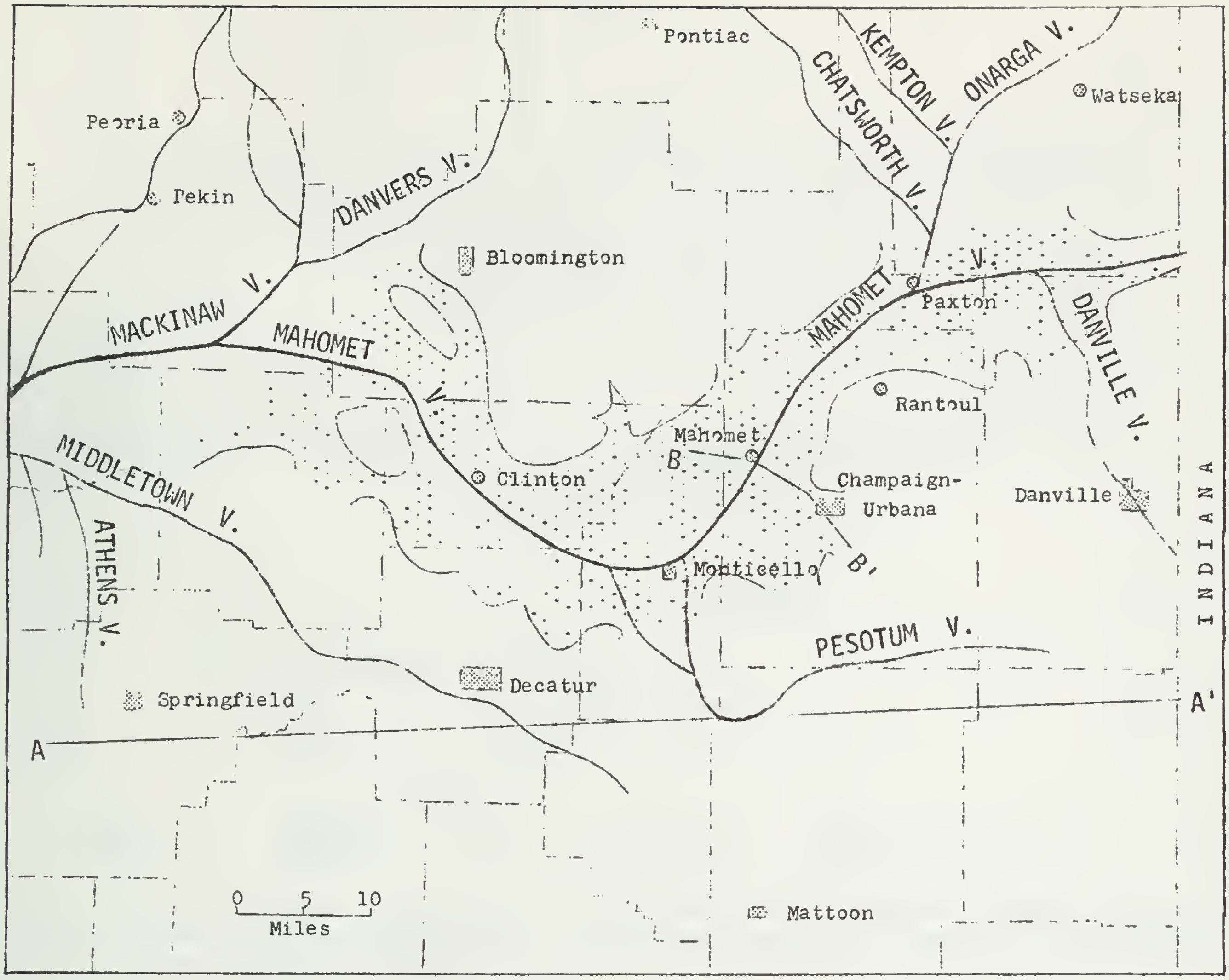


Fig. 8 - Map of east-central Illinois showing axes of major bedrock valleys. Width of the Mahomet Valley at the 500-foot elevation is indicated by the stippled pattern. A-A' is the line of cross section in figure 7. Line B-B' is the line of cross section in figure 9.

specific capacity of the well is 75 gallons per minute per foot of drawdown of the water level. With the present pump, the well will yield 300 to 400 gallons per minute or about one-half million gallons per day, but with a larger pump, the well could yield 1 million gallons per day. The water is of very good quality, containing 372 parts per million total dissolved minerals. Most of the dissolved minerals are calcium and magnesium carbonates so that the water is relatively hard. Water temperature at the well head is about 51° F.

The static (unpumped) water level in the well when tested was at a depth of 81 feet, or 131 feet above the top of the Mahomet Sand. Thus, the well is artesian. This means that the groundwater in the Mahomet Sand is confined under hydrostatic pressure which causes the water to rise above the aquifer without pumping. Artesian conditions are produced where a saturated aquifer is overlain by a less permeable layer that restricts the upward movement of the water. The confining layer above the Mahomet Sand is formed by Kansan till and outwash silt deposits. In some aquifers, confining pressures are sufficient to produce flowing wells.

The well has a 36-inch diameter bore with a 12-inch inner casing and a 40-foot screen at the bottom of the hole in the Mahomet Sand. Screen slots are

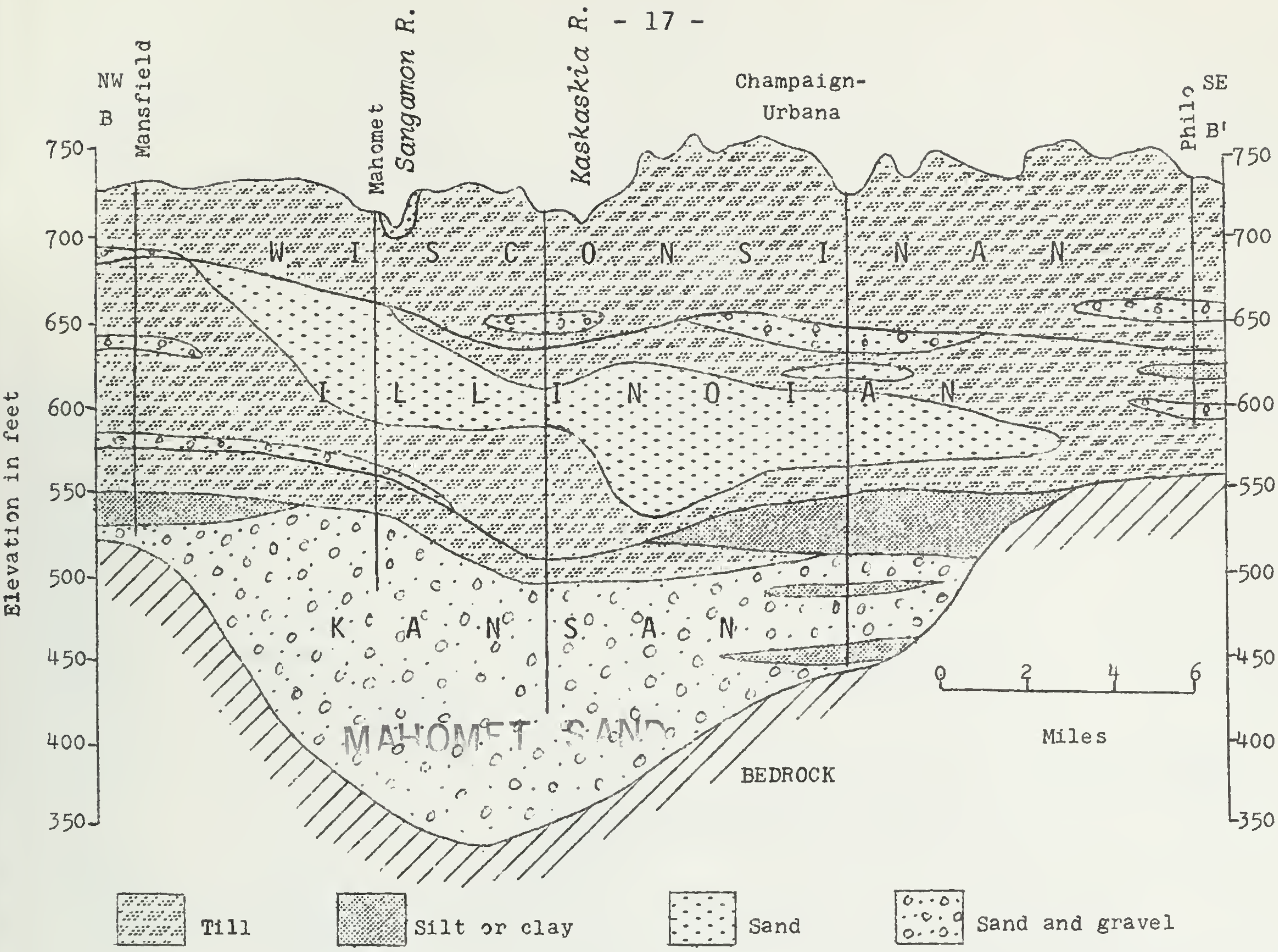


Fig. 9 - Generalized geologic cross section of the Mahomet Bedrock Valley near Champaign-Urbana. See figure 8 for the line of cross-section. Five of the numerous wells used to plot the geologic data are indicated by vertical lines.

.120-inch wide (about 1/8 inch wide). The bottom of the well was finished with a 90-foot artificial gravel pack around the screen and casing to prevent entry of fine sand into the well bore, which would plug up the screen. The gravel pack insures continued high water yield. The top of the gravel pack was capped by a concrete seal and the remainder of the hole around the casing was filled with sand.

The Illinois State Water Survey reports that in 1967 Illinois used 3.3 billion gallons of water per day, of which 660 million gallons per day came from wells. Approximately 450 million gallons per day were pumped from wells in sand and gravel aquifers of glacial origin. As a mineral commodity, the groundwater pumped from these glacial aquifers is estimated to have a value of over $115 million, making it one of Illinois' more valuable commodities. In comparison, the values of other minerals produced in Illinois in 1967 were as follows: coal, $251.5 million; petroleum, $181.5 million; stone, $63.1 million and sand and gravel, $30.4 million.

The Mahomet Valley is the most important source of groundwater in east-central Illinois. Its presence is most fortunate, because bedrock formations in this region are relatively impermeable or contain water that is too saline for human consumption below a depth of a few hundred feet. Approximately 16 million gallons per day for municipal, rural, and industrial uses are pumped from the Mahomet Valley in the Champaign-Urbana area, most of it from Mahomet Sand. During summer peaks, the amount exceeds 27 million gallons per day. Most municipal and industrial wells in the

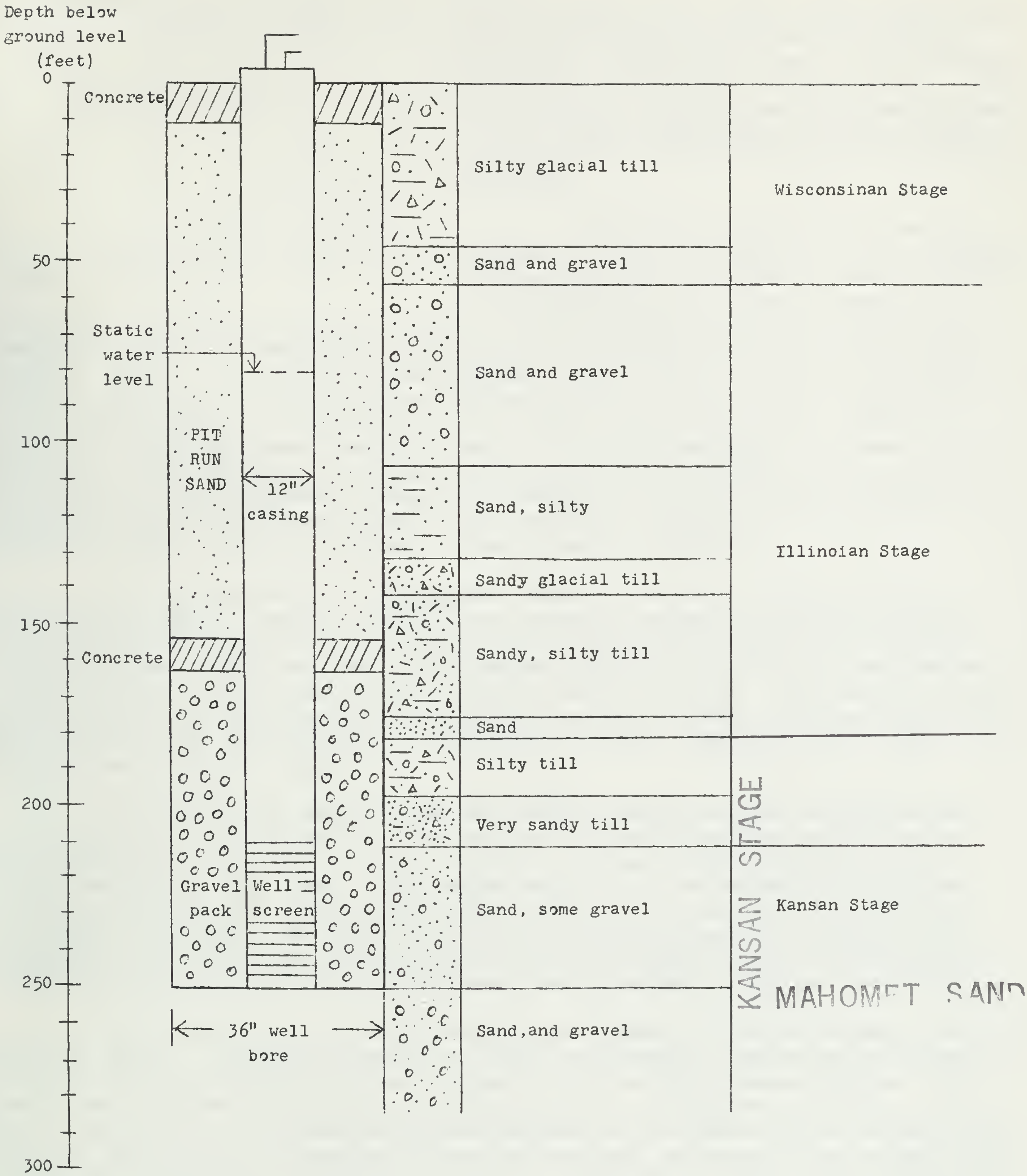


Fig. 10 - Diagram of Mahomet Well #3 showing the design of the well and the glacial deposits penetrated in Mahomet Valley.

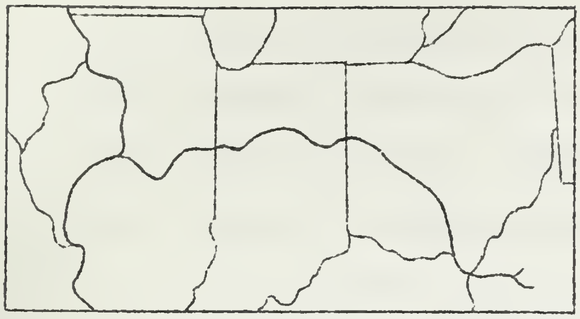


Fig. 11 - Map showing the course of the preglacial Teays River.

Mahomet Valley are capable of producing 1 million gallons per day, and the best wells, which are in the Mahomet Sand, have potential capacities of 30 million gallons per day. The Water Survey considers that the present amount of groundwater being pumped from the Mahomet Valley is only a small fraction of the amount available.

Considering the sizes of present streams in the field trip area, it is difficult to imagine that at one time a river rivaling the Mississippi River flowed through this vicinity. The Mahomet Valley is believed to have been the lower course of a great preglacial river (the Teays River) that headed in the Blue Ridge Mountains of West Virginia (fig. 11). The river flowed westward across Ohio and Indiana to central Illinois, where it joined the Ancient Mississippi River which at that time occupied the Illinois Valley. In the glaciated area where the valley has been buried by drift, its course has been traced by means of subsurface geologic and seismic data. The valley enters Illinois in extreme southeastern Iroquois County, follows a broad southward arc past Champaign and Mahomet to Monticello and then turns northward to join the Mackinaw bedrock valley, a buried portion of the Illinois Valley, in southern Tazewell Connty, a distance of approximately 135 miles.

The Mahomet Valley is an enormous feature. It has an average depth of more than 200 feet. Its bottom lies at an average elevation of 350 feet above sea level, 200 to 300 feet below the surface of the adjoining bedrock upland (fig. 9). At an elevation of 500 feet, the valley varies in width from 5 miles at the Indiana line to almost 20 miles near Clinton in DeWitt County (fig. 8). The valley is completely buried and has no noticeable surface expression. Over its deepest part, the drift is more than 400 feet thick. The thickest drift occurs where the Wisconsinan end moraines cross the valley.

It is not known exactly when the Mahomet Valley and its tributaries were cut. However, it is believed that the valleys were established before the Ice Age about one million years ago, and that they had been only slightly eroded in the bedrock surface at that time. Since Kansan drift fills the bottom of the valleys, they were entrenched to their greatest depth before or during the earliest part of the Kansan glaciation. The major part of valley cutting probably occurred between 1,000,000 and 700,000 years ago during the Nebraskan glacial interval and the long Aftonian interglacial interval that followed (see attached Pleistocene Time Table).

By the end of the Kansan glaciation, the Mahomet Valley was almost completely filled by drift. The Mahomet Sand is a valley train deposit, deposited by meltwater that was channeled down Mahomet Valley ahead of the advancing Kansan glacier. The glacier overrode the valley train and deposited till. During the Yarmouthian interglacial interval that followed the Kansan glaciation, the valley again carried drainage, but the stream was probably much smaller than the pre-Kansan river because little erosion of the Kansan valley fill took place. Burial of the valley was completed by the deposition of till and outwash during the Illinoian glaciation, the most extensive glaciation of Illinois. The Wisconsinan glacier added to the cover of drift.

Leave Stop 7. Continue ahead (east) on Dunbar Street.

STOP. Turn right (south) on Elm Street.

0.2 36.7 STOP. Intersection with Route 150 (Oak Street). Turn right (west).

0.2 36.9 Junction with Route 47 South. Turn left (south).

0.2 37.1 Railroad crossing. CAUTION. Continue ahead south.

0.3 37.4 Entrance to Gibson Brothers Gravel Pit. Turn right into pit.

Follow haulage road back to working face.

Stop 8. Cerro Gordo outwash in terrace of Sangamon Valley (S 1/2 SE 1/4 SE 1/4, Sec. 16, T. 20 N., R. 7 E.).

This is the first of two stops that will be made to examine outwash in the Sangamon Valley. This gravel pit is one of several operating in the vicinity of Mahomet and farther downstream in terraces that were cut into the Cerro Gordo outwash plain by meltwater from the Champaign glacier. In this locality, the outwash is covered by a few feet of Peoria Loess. In a few places in the pit, a thin layer of till-like material overlies the outwash. Since this locality is at the front edge of the Champaign Moraine, it may be Champaign till. The material taken out of this pit is used as construction fill. It is not processed by screening into the various size grades but is mixed with the overburden and used exactly as it comes from the pit.

As discussed earlier, outwash is rock debris that was released from a melting glacier and then transported and redeposited by meltwater. Unlike till, outwash is characteristically stratified (layered). Because of the sorting action of the flowing water, layers of finer sizes alternate with layers of coarser sizes. The swifter the currents that deposited the outwash, the coarser the outwash. Sorting also occurred laterally and outwash deposits become finer in a downstream direction away from the source of the meltwater. Within layers, the outwash is usually crossbedded. Crossbeds are laminations or beds that are inclined at an angle to the main planes of stratification. Stratification, crossbedding and sorting are features that formed in response to the continually changing volume and velocity of the meltwater.

The outwash exposed in this pit exhibits all of the characteristics described above. Some beds are fine grained and silty, especially in the east side of the pit. These beds were deposited in quiet water, probably temporary shallow meltwater ponds. The outwash has been tentatively established as Cerro Gordo outwash. as a result of studies by Survey geologists. The outwash can be traced southeastward to the edge of the Cerro Gordo Moraine and it becomes coarser grained in that direction. The distribution of the outwash along the Sangamon Valley would suggest that it may be a valley train of the Champaign glacier. However, the outwash does not become finer grained downstream.

The texture of the Cerro Gordo outwash ranges from pebbly sand to sandy gravel. Some cobbles are present in the gravel, but in general, the outwash consists predominantly of sand. The scarcity of coarse material in the Cerro Gordo outwash has restricted the extent of its exploitation in this area as a mineral commodity. However, by washing, screening and crushing, a variety of size grades can be produced. The fine sand is used as mason's sand and the coarser sand is used as concrete aggregate. Coarse sand and fine gravel are used as blacktop aggregate. Size grades of gravel are also produced for use as roadstone. Some of the coarser gravel is used as concrete aggregate, but it is not a good quality aggregate stone. Analysis of the pebble fraction showed 53 percent dolomite, 16 percent sandstone and shale,

15 percent igneous and metamorphic, 10 percent chert and 5 percent limestone fragments. The high chert content and the abundance of sandstone and shale fragments are undesirable constituents in aggregate gravel.

Leave Stop 8. Return to Route 47. At intersection turn right (south).

0.3 37.7 Sangamon River bridge.

0.2 37.9 Crossroads. Turn right (west) on gravel road.

0.7 38.6 Entrance to Pontiac Stone Company sand and gravel pit. Continue ahead west.

0.3 38.9 Entrance to Mid States Materials Company sand and gravel pit.

Turn right and enter pit area.

Stop 9. Collect rocks in gravel stock pile (SE 1/4 NE 1/4, Sec. 20, T. 20 N., R. 7 E.).

The outwash in this pit is excavated with a slackline bucket. The cable is attached to a deadman (anchoring device) on one side of the pond and a mast and drawworks on the opposite side. The bucket is dragged along the bottom of the pond and the sand and gravel is pulled out and dumped into a surge bin. A conveyer transfers the material to the washing and screening tower where it is sorted into the various size grades. The bucket is returned to the pit by gravity.

This pit produces somewhat coarser material than other pits in this area. The cobbles and boulders are stockpiled and then later crushed to gravel size for roadstone. The stockpile affords an excellent opportunity to collect rock and mineral specimens. These include fossils and fossiliferous rock fragments that were eroded from the Paleozoic rocks over which the glacier moved as it crossed Illinois and Indiana.

END OF FIELD TRIP

DRIVE CAREFULLY ON YOUR WAY HOME

LIST OF PROPERTY OWNERS

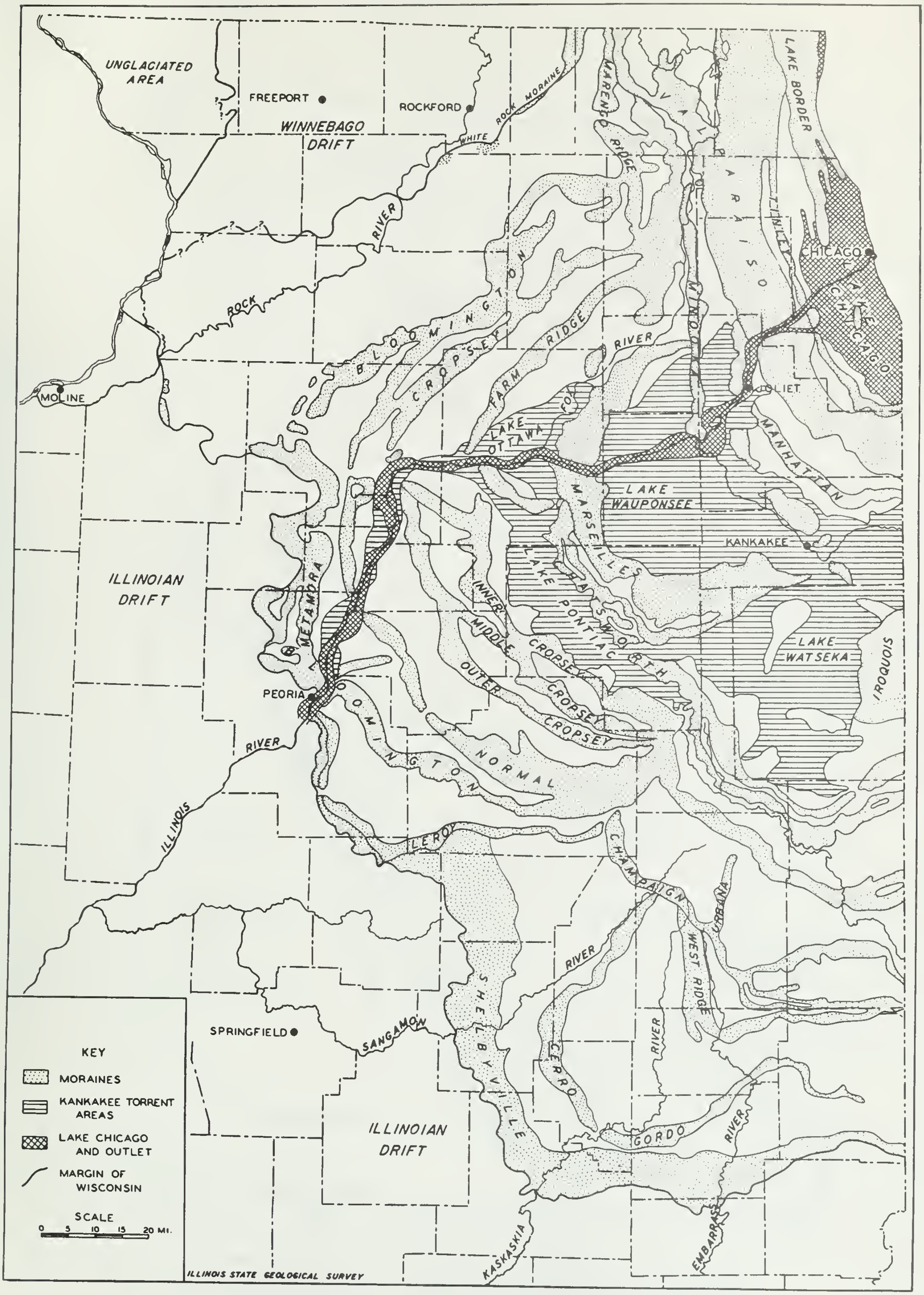
Stop 3. Mr. Dean McCartney, R. R. 1, White Heath, Illinois 61884.

Stop 8. Gibson Brothers Sand and Gravel Pit, Mahomet, Illinois 61853.

Stop 9. Mid States Materials, Inc. (Rowe Construction Company), Mahomet, Illinois 61853.

TIME TABLE OF PLEISTOCENE GLACIATION
(Illinois State Geological Survey, 1969)

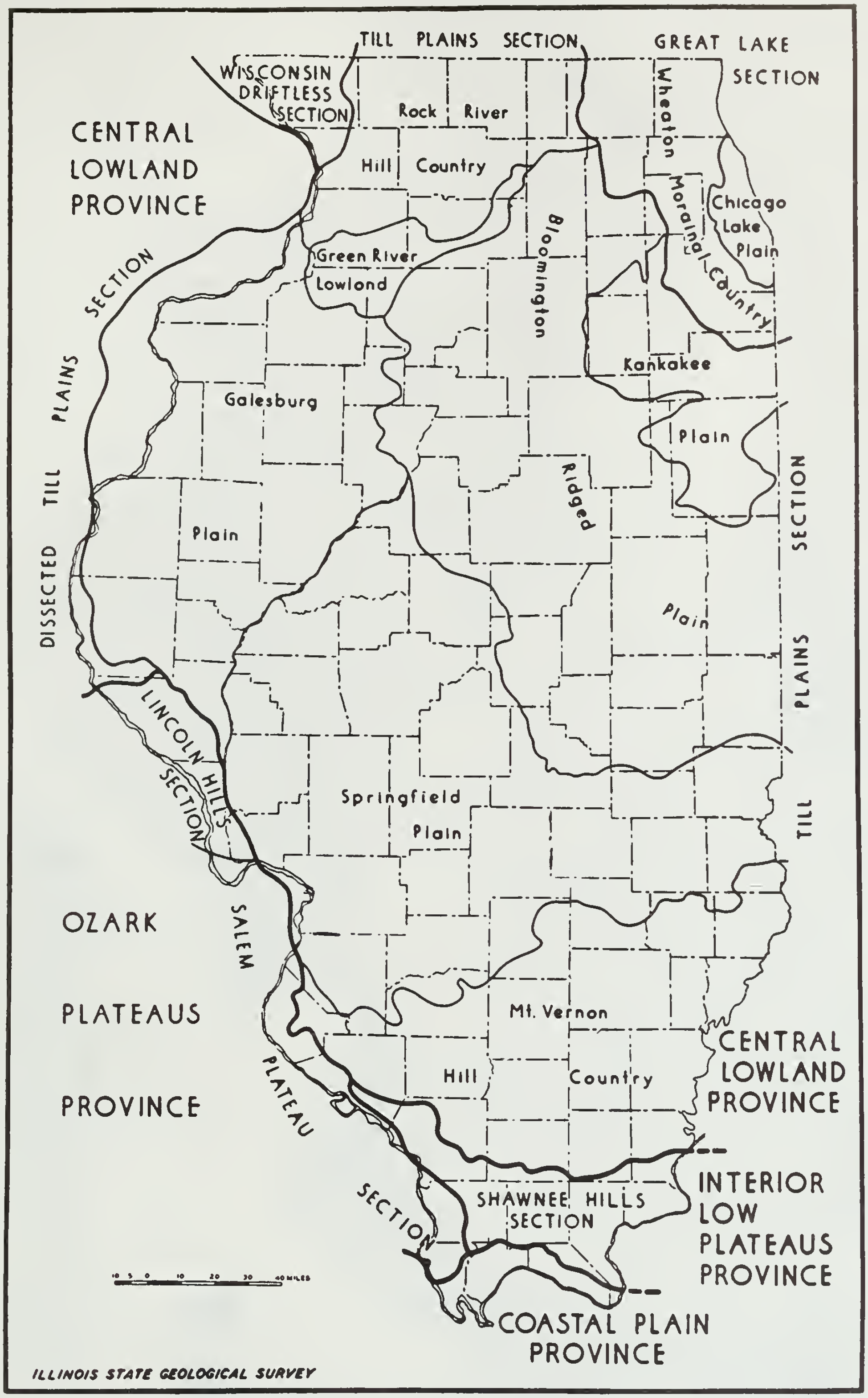
STAGE	SUBSTAGE	NATURE OF DEPOSITS	SPECIAL FEATURES
RECENT	Years Before Present	Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
	5,000		
WISCONSINAN (4th glacial)	Valderan	Outwash	Outwash along Mississippi Valley
	11,000		
	Twocreekan	Peat and alluvium	Ice withdrawal, erosion
	12,500		
	Woodfordian	Drift, loess, dunes, lake deposits	Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes
	22,000		
	Farmdalian	Soil, silt, and peat	Ice withdrawal, weathering, and erosion
	28,000		
	Altonian	Drift, loess	Glaciation in northern Illinois, valley trains along major rivers, Winnebago drift
	50,000 to 70,000		
SANGAMONIAN (3rd interglacial)		Soil, mature profile of weathering	
ILLINOIAN (3rd glacial)	Buffalo Hart	Drift	Glaciers from northeast at maximum reached Mississippi River and nearly to southern tip of Illinois
	Jacksonville	Drift	
	Liman	Drift, loess	
YARMOUTHIAN (2nd interglacial)		Soil, mature profile of weathering	
KANSAN (2nd glacial)		Drift Loess	Glaciers from northeast and northwest covered much of state
AFTONIAN (1st interglacial)		Soil, mature profile of weathering	
NEBRASKAN (1st glacial)		Drift	Glaciers from northwest invaded western Illinois



GLACIAL MAP OF NORTHEASTERN ILLINOIS

George Ekblaw

Revised 1960

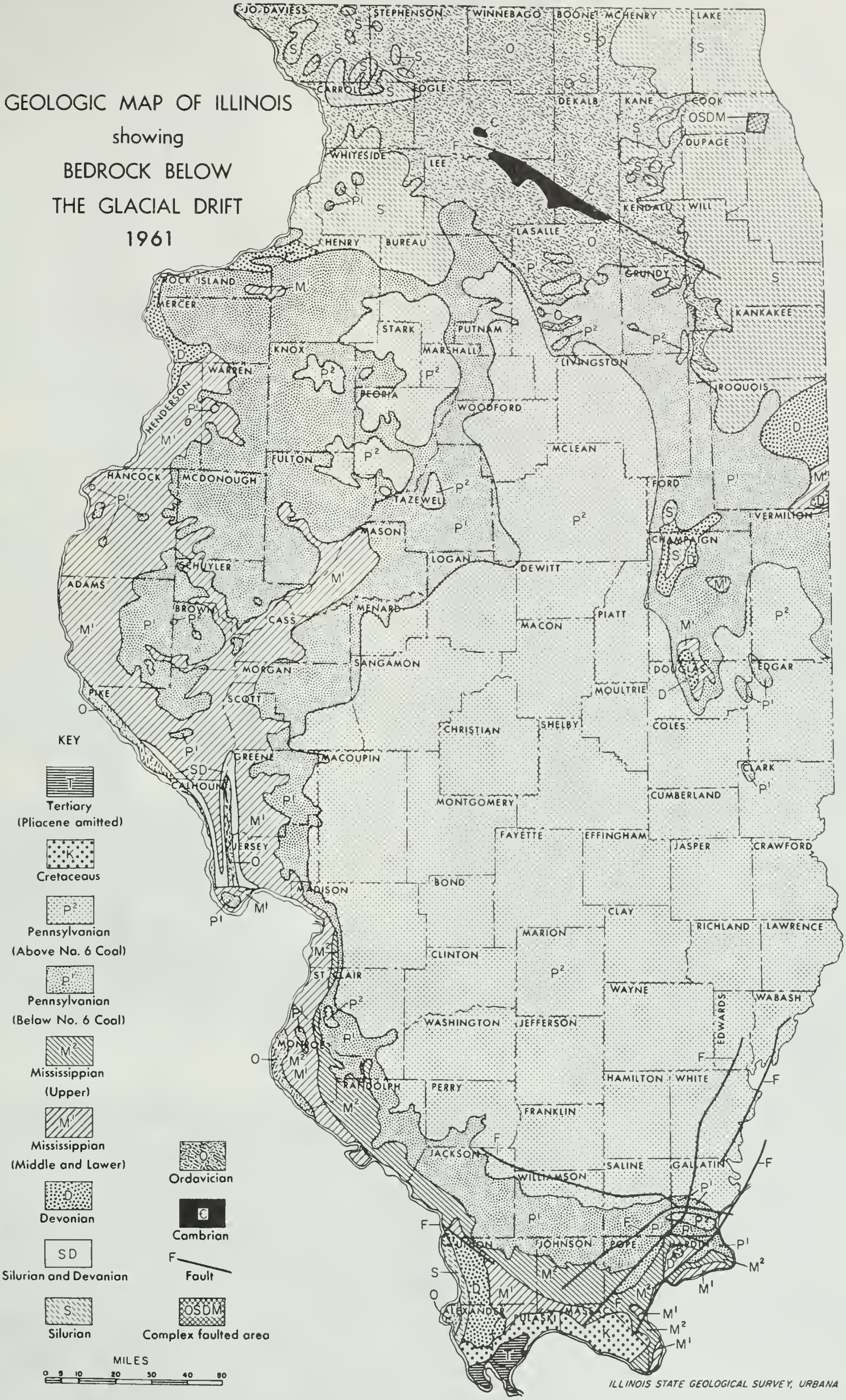


PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Illinois State Geological Survey Report of Investigations 129, "Physiographic Divisions of Illinois," by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

(33307—15M—10-66)

GEOLOGIC MAP OF ILLINOIS
showing
BEDROCK BELOW
THE GLACIAL DRIFT
1961



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